{{<P=41><C=04><S=core><T=MC><M=2><L=1><X=H><id=001>}}

4141001

A coil is placed between two slab-shaped magnets. The coil keeps rotating because of the magnetic force acting on it. Which of the following **cannot** increase the turning effect on the coil?

A Increase the number of turns in the coil.

B Use stronger magnets.

C Use thinner wire to make the coil.

D Increase the current through the coil.

{{<P=41><C=04><S=core><T=MC><M=2><L=1><X=F><id=002>}}

4141002

F A current I passes through a long solenoid of N turns. The length and radius of the solenoid are l and r respectively. The magnetic field produced inside the solenoid is B. Another long solenoid has $2N$ turns, a length of $2l$ and a radius of $2r$. If the current passing through this solenoid is $2I$, what is the magnetic field produced inside this solenoid?

A $4B$

B $2B$

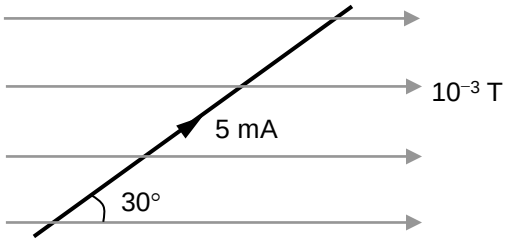
C B

D $\frac{B}{2}$

{{<P=41><C=04><S=core><T=MC><M=2><L=1><X=F><id=003>}}

4141003

F A straight wire of 0.4 m long carries a current of 5 mA in a uniform magnetic field of 10^{-3} T. The angle between the wire and the magnetic field is 30° as shown. What is the magnitude of the magnetic force on the wire?



A 1×10^{-6} N

B 2×10^{-6} N

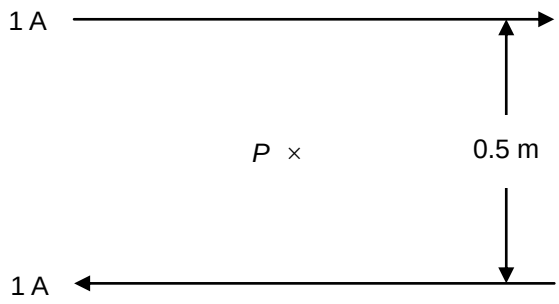
C 1×10^{-3} N

D 2×10^{-3} N

{{<P=41><C=04><S=core><T=MC><M=2><L=1><X=F><id=004>}}

4141004

F The figure below shows two long parallel straight wires separated by a distance of 0.5 m. They carry currents of 1 A in opposite directions.



P is the mid-point between the wires. What is the magnetic field at *P*?

(Given the permeability of free space $\mu_0 = 4\pi \times 10^{-7}$ T m A^{-1})

A 0.8×10^{-7} T into the paper

B 1.6×10^{-6} T into the paper

C 0.8×10^{-7} T out of the paper

D 1.6×10^{-6} T out of the paper

{{<P=41><C=04><S=core><T=MC><M=2><L=1><X=F><id=005>}}

4141005

F For two long straight parallel wires carrying the same current, the magnitude of the magnetic force acting on a section of the wires depends on

(1) the distance between the wires.

(2) the length of that section of the wires.

(3) the magnitude of current flowing in the wires.

A (1) and (2) only

B (1) and (3) only

C (2) and (3) only

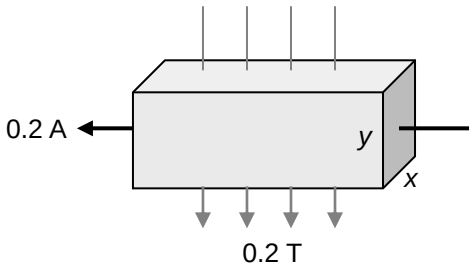
D (1), (2) and (3)

{{<P=41><C=04><S=extension><T=MC><M=2><L=1><X=F><id=006>}}

4141006

F E The slice of semiconductor in a Hall probe has 10^{25} charge carriers per cubic metre. When a steady current of 0.2 A passes through the slice and a constant magnetic field of 0.2 T applied perpendicularly to it, a Hall voltage of 10 μV is set up. Find the thickness *y* of the slice.

(Given the charge of a charge carrier = 1.6×10^{-19} C)



A 10^{-5} m

B 2.5×10^{-4} m

C 0.025 m

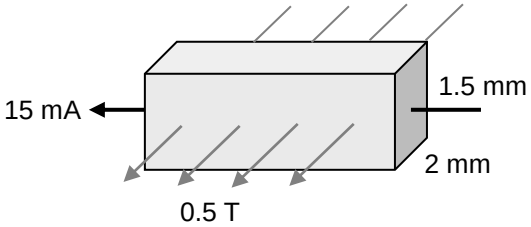
D 0.05 m

{{<P=41><C=04><S=extension><T=MC><M=2><L=1><X=F><id=007>}}

4141007

F E In a Hall probe, the thickness and width of the semiconductor are 1.5 mm and 2 mm respectively. When a steady current of 15 mA passes through the semiconductor and a uniform magnetic field of 0.5 T is applied perpendicularly to it, a Hall voltage of 15 μV is set up. Find the number of charge carriers per cubic metre in the semiconductor.

(Given the charge of a charge carrier = 1.6×10^{-19} C)



A 1.56×10^{21}

B 3.13×10^{21}

C 1.56×10^{24}

D 3.13×10^{24}

{{<P=41><C=04><S=core><T=MC><M=2><L=1><X=F><id=008>}}

4141008

F A flat circular coil *X* of radius 5 cm is placed at the centre of another flat circular coil *Y* of radius 10 cm. Each coil has 100 turns and is parallel to each other. Coil *X* carries a current of 3 A while coil *Y* carries a current of 6 A in the opposite direction. What is the magnitude of the total magnetic field at the centre of the coils?

A 0

B 1500 μ_0

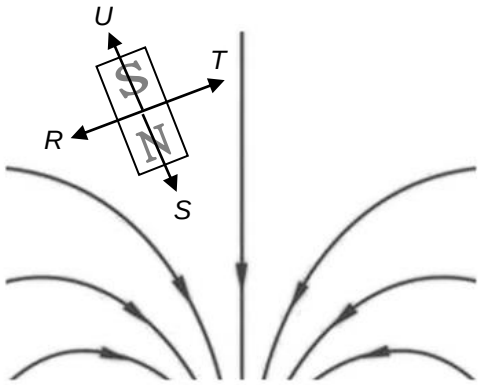
C 3000 μ_0

D 4500 μ_0

{{<P=41><C=04><S=core><T=MC><M=2><L=1><X=H><id=009>}}

4141009

The following figure shows the magnetic field in a region.



If a small bar magnet is put at the position shown, in which direction does the small magnet move?

A *R*

B *S*

C *T*

D U

{{<P=41><C=04><S=core><T=MC><M=2><L=1><X=H><id=010>}}

4141010

Which of the following devices must use an electromagnet rather than a permanent magnet?

(1) A crane that transports junk cars from one place to another

(2) Earpiece of a telephone

(3) An electric door lock

A (1) and (2) only

B (1) and (3) only

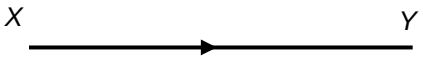
C (2) and (3) only

D (1), (2) and (3)

{{<P=41><C=04><S=core><T=MC><M=2><L=1><X=H><id=011>}}

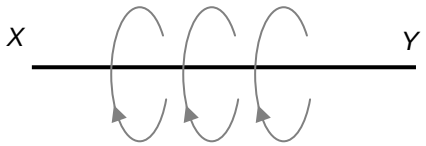
4141011

The following figure shows a current flowing along a wire, from *X* to *Y*.

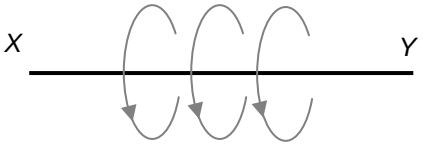


Which of the following figures best represents the magnetic field produced?

A

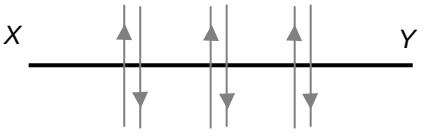


B



C

D



{{<P=41><C=04><S=core><T=MC><M=2><L=1><X=H><id=012>}}

4141012

Which of the following appliances does not need an electromagnet?

A d.c. motor

B Earpiece of telephone

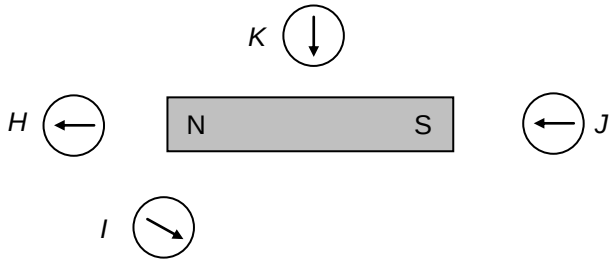
C Loudspeaker

D Electric bell

{{<P=41><C=04><S=core><T=MC><M=2><L=1><X=H><id=013>}}

4141013

Four compasses are placed around a bar magnet as shown in the following figure.



Which compass is not working properly?

A *H*

B *I*

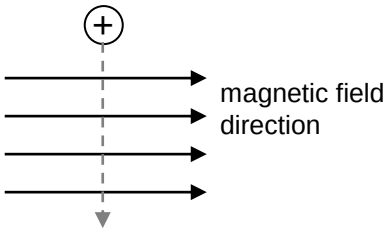
C *J*

D *K*

{{<P=41><C=04><S=core><T=MC><M=2><L=1><X=H><id=014>}}

4141014

A positively-charged particle is falling into a magnetic field as shown.



Towards which direction will the particle be deflected?

A Into the paper

B Out of the paper

C Towards the left

D Towards the right

{{<P=41><C=04><S=core><T=MC><M=2><L=1><X=H><id=015>}}

4141015

In the following figure, some compasses are placed around a current-carrying cable. What is the direction of the current?

A Upwards

B Downwards

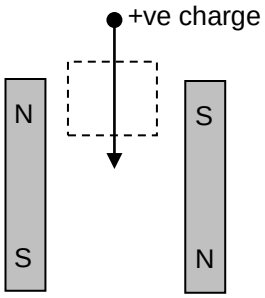
C Clockwise

D Anticlockwise

{{<P=41><C=04><S=core><T=MC><M=2><L=1><X=H><id=016>}}

4141016

The following figure shows two bar magnets with opposite poles facing each other.



When a positive charge moves across the dashed region, in which direction will it be deflected?

A To the left

B To the right

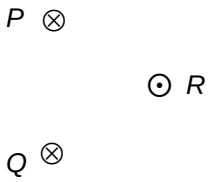
C Into the paper

D Out of the paper

{{<P=41><C=04><S=core><T=MC><M=2><L=1><X=H><id=017>}}

4141017

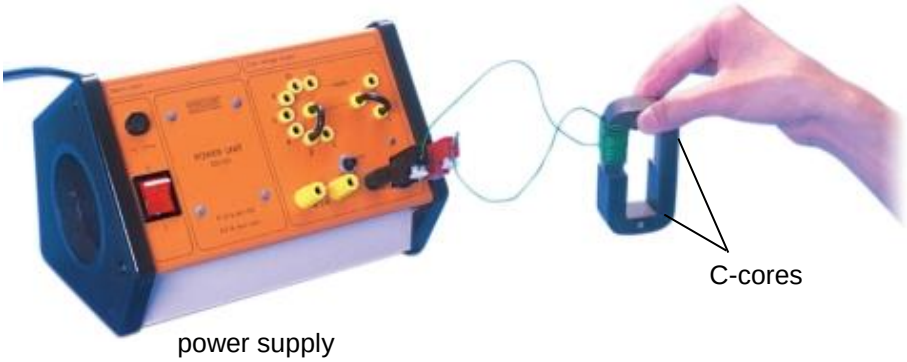
P, *Q*, and *R* are three parallel straight wires carrying equal current. *R* is equidistant from *P* and *Q*. What is the direction of the resultant force acting on *R* by *P* and *Q*?



A →
B ←
C ↑
D ↓

{{<P=41><C=04><S=core><T=MC><M=2><L=1><X=H><id=018>}}

4141018



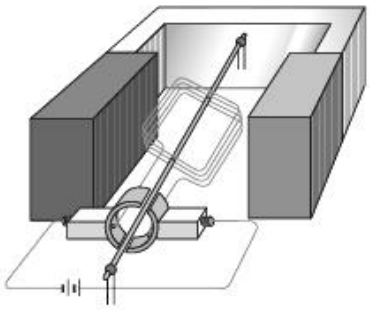
A C-core wound with current-carrying wire can pick up another C-core. Which of the following **cannot** increase the strength of attraction?

A Increase the size of current.
B Wind more turns around the C-core.
C Use a thicker wire.
D Reverse the polarities of the power supply.

{{<P=41><C=04><S=core><T=MC><M=2><L=1><X=H><id=019>}}

4141019

Which of the following **cannot** make the coil in a motor rotate faster?



A Increase the current.

B Increase the number of turns in the coil.

C Wind the coil on an aluminium core.

D Use stronger magnets.

{{<P=41><C=04><S=core><T=MC><M=2><L=2><X=F><id=020>}}

4141020

★

F Two long vertical wires *X* and *Y* are placed at right angle to the Earth's magnetic field with a short distance apart. When each wire carries the same current *I*, the force on *X* due to the Earth's field is $\overrightarrow{F_e}$ and the force on *X* due to the current through *Y* is $\overrightarrow{F_c}$. The current is now halved in both wires, what is the resultant force on *X*?

A $\frac{1}{2}\overrightarrow{F_e}+\frac{1}{4}\overrightarrow{F_c}$

B $\overrightarrow{F_e}+\overrightarrow{F_c}$

C $\overrightarrow{F_e}+2\overrightarrow{F_c}$

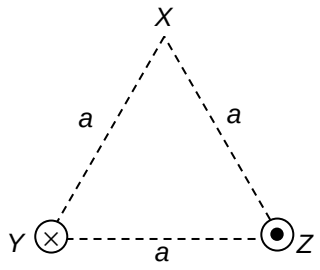
D $2\overrightarrow{F_e}+4\overrightarrow{F_c}$

{{<P=41><C=04><S=core><T=MC><M=2><L=2><X=F><id=021>}}

4141021

★

F As shown below, *XYZ* are the vertices on an equilateral triangle of side length *a*. Two long straight parallel wires, each carrying a current *I*, are placed at points *Y* and *Z* respectively.



What is the magnetic field at X?

A $\frac{\mu_0 I}{2\pi a}$ (to the left)

B $\frac{\sqrt{3}\mu_0 I}{2\pi a}$ (to the left)

C $\frac{\mu_0 I}{2\pi a}$ (downwards)

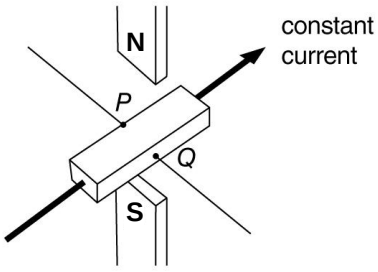
D $\frac{\sqrt{3}\mu_0 I}{2\pi a}$ (downwards)

{{<P=41><C=04><S=extension><T=MC><M=2><L=2><X=F><id=022>}}

4141022

★

F E The figure below shows the essential parts of an apparatus to demonstrate the Hall effect.



Which of the following statements is/are correct?

(1) The Hall voltage is developed across *PQ*.

(2) The magnitude of the Hall voltage increases if the applied magnetic field is weaker.

(3) The magnitude of the Hall voltage decreases if the width *PQ* increases.

A (1) only

B (1) and (2) only

C (2) and (3) only

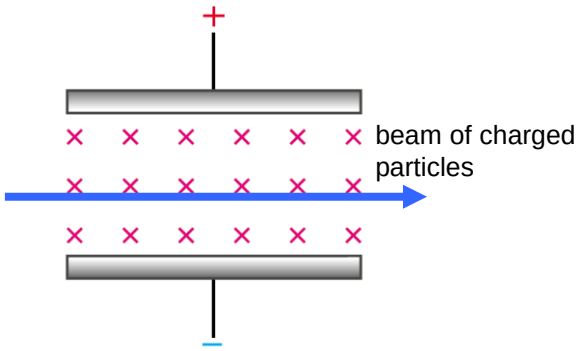
D (1), (2) and (3)

{{<P=41><C=04><S=extension><T=MC><M=2><L=2><X=F><id=023>}}

4141023

★

F E A beam of charged particles passes undeflected through a region of crossed uniform electric and magnetic fields as shown. The fields remain constant. Which of the following must be constant for the particles making up this beam?



A Charge to mass ratio

B Velocity

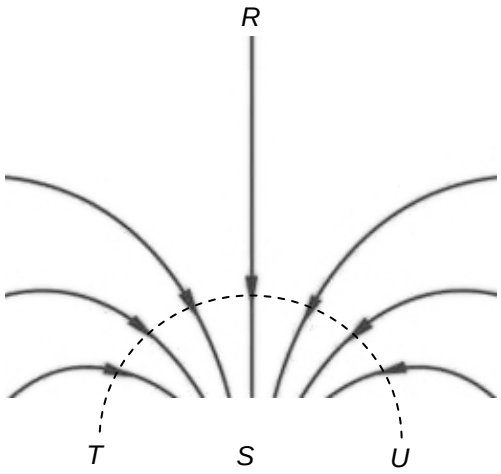
C Mass

D Magnitude of charge

{{<P=41><C=04><S=core><T=MC><M=2><L=2><X=H><id=024>}}

4141024

★ The following figure shows the magnetic field in a region.



Which of the following is correct?

A If a point charge moves along *RS*, the force that it experiences increases.

B If an iron grain moves along *RS*, the force that it experiences increases.

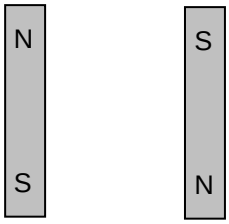
C If a point charge moves along the arc *TU*, it will not experience any force.

D If an iron grain moves along the arc *TU*, it will not experience any force.

{{<P=41><C=04><S=core><T=MC><M=2><L=2><X=H><id=025>}}

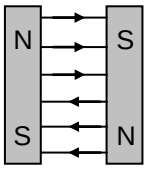
4141025

★ The figure below shows two bar magnets with opposite poles facing each other.

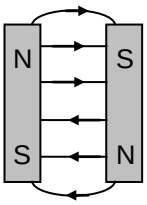


Which of the following best shows the correct magnetic field pattern between the above magnets?

A

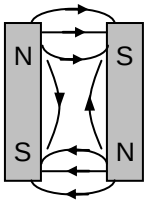


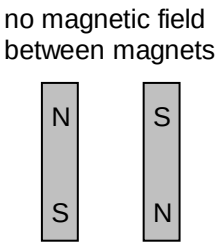
B



C

D

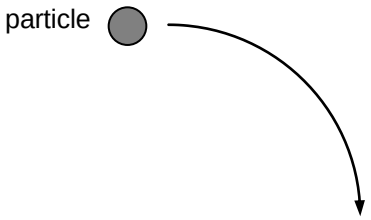




{{<P=41><C=04><S=core><T=MC><M=2><L=2><X=H><id=026>}}

4141026

★ When a particle moves in a uniform magnetic field, it experiences a force and moves along a curve as shown in the following figure.



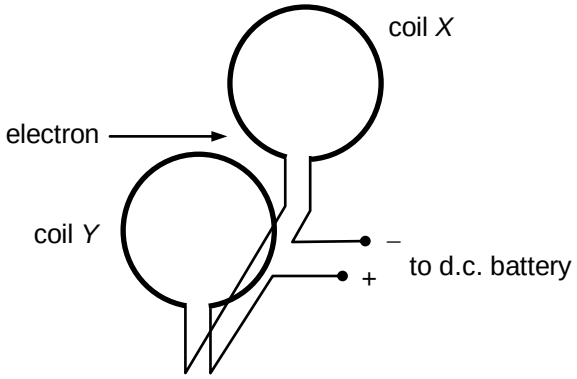
Which of the following can be the direction of the magnetic field and the charge of the particle?

	Direction of magnetic field	**Charge of particle**
A	Towards the right	Positive
B	Towards the left	Negative
C	Into the paper	Neutral
D	Out of the paper	Positive

{{<P=41><C=04><S=core><T=MC><M=2><L=2><X=H><id=027>}}

4141027

★ An electron moves along the middle line between coils *X* and *Y* in the horizontal direction, as shown in the following figure.



In which direction does the electron deflect after passing the coils?

A Towards the coil *Y*

B Upwards

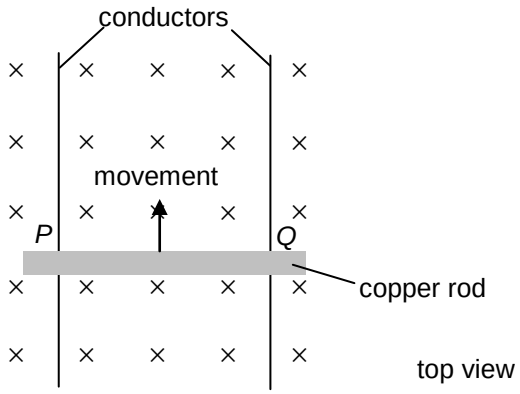
C Downwards

D No deflection

{{<P=41><C=04><S=core><T=MC><M=2><L=2><X=H><id=028>}}

4141028

★ The following figure shows a copper rod moving along two horizontal current-carrying conductors in a uniform magnetic field.



Which of the following statements is correct?

A The rod is moving with a decreasing speed.

B Current flows from *Q* to *P*.

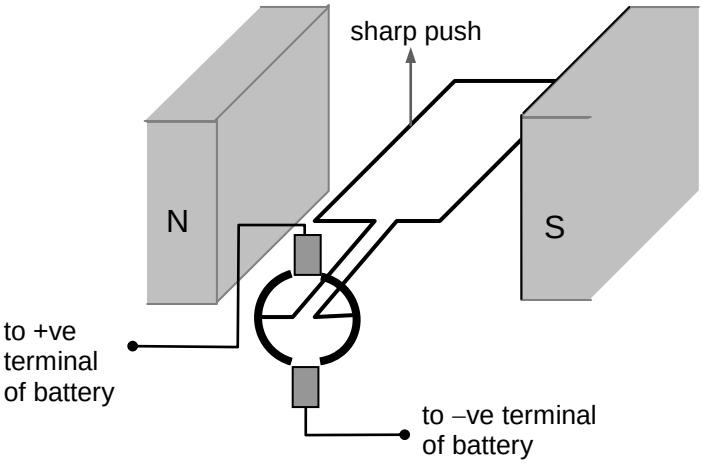
C The magnetic force is doing work on the rod.

D The rod would move faster if it is heavier.

{{<P=41><C=04><S=core><T=MC><M=2><L=2><X=H><id=029>}}

4141029

★ The coil of a motor lies along the horizontal plane at the beginning as shown in the following figure.



If the left side of the coil is pushed sharply upwards, what is the motion of the coil when viewed from the commutator?

A The coil rotates in clockwise direction.

B The coil rotates in anticlockwise direction.

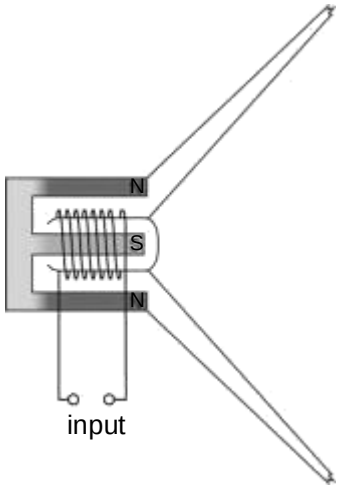
C The coil vibrates about the vertical plane.

D The coil vibrates about the horizontal plane.

{{<P=41><C=04><S=core><T=MC><M=2><L=2><X=H><id=030>}}

4141030

★ The following figure shows a loudspeaker.



Which of the following input has the same result as when there is no input?

(1) An a.c. supply of 50 Hz

(2) A d.c. source with varying current

(3) A battery

A (1) only

B (2) only

C (3) only

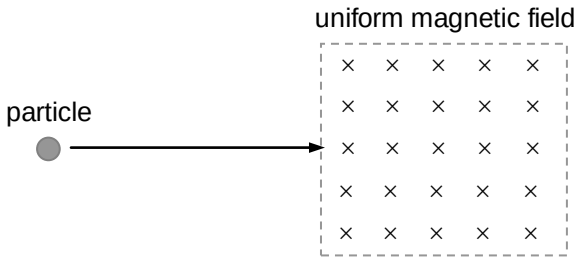
D (1), (2) and (3)

{{<P=41><C=04><S=core><T=MC><M=2><L=2><X=F><id=031>}}

4141031

★

F In the following figure, a particle with velocity *v* enters a uniform magnetic field.



From the path of the particle, which of the following characters of the particle can be determined?

(1) Type of charge

(2) Mass to charge ratio

(3) Size

A (1) only

B (1) and (2) only

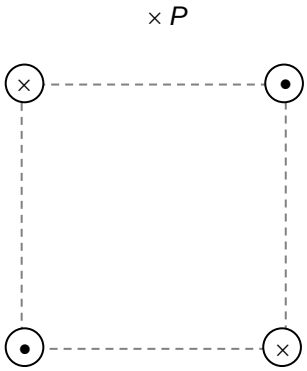
C (1) and (3) only

D (1), (2) and (3)

{{<P=41><C=04><S=core><T=MC><M=2><L=2><X=H><id=032>}}

4141032

★ The figure below shows the current direction in four wires. The currents are of the same value. What is the direction of the magnetic field at *P*?



A Upwards

B Downwards

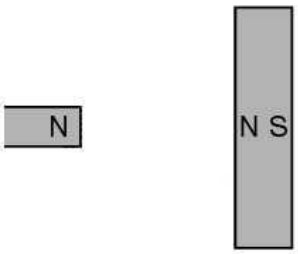
C Towards the left

D No magnetic field at *P*

{{<P=41><C=04><S=core><T=MC><M=2><L=2><X=H><id=033>}}

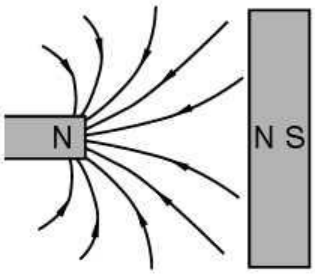
4141033

★ A bar magnet and a slab-shaped magnet are arranged as shown in the following figure.

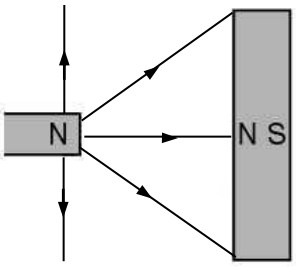


Which of the following best represents the magnetic field lines between these magnets?

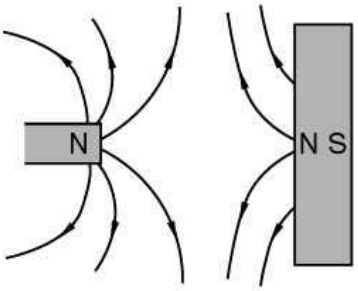
A



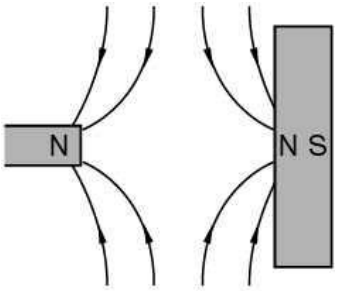
B



C



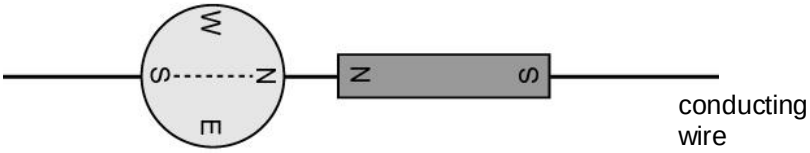
D



{{<P=41><C=04><S=core><T=MC><M=2><L=2><X=H><id=034>}}

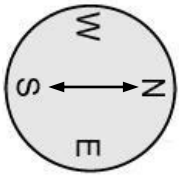
4141034

★ In the following figure, a compass is placed above a conducting wire and it is close to a magnet.

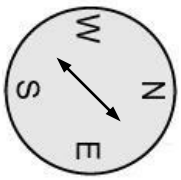


If the current in the wire flows towards the right, in which direction does the compass point to?

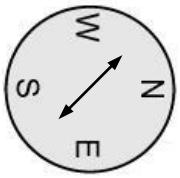
A



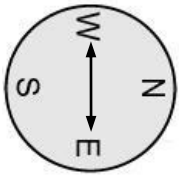
B



C



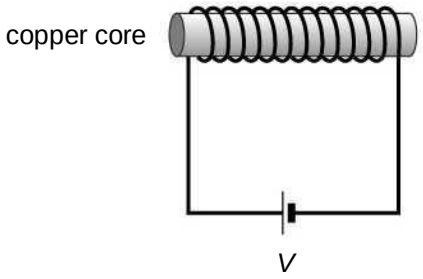
D



{{<P=41><C=04><S=core><T=MC><M=2><L=2><X=H><id=035>}}

4141035

★ The following figure shows a solenoid.



Which of the following changes can increase the strength of the magnetic field outside the solenoid?

A Increase the length of the solenoid.

B Use a larger copper core.

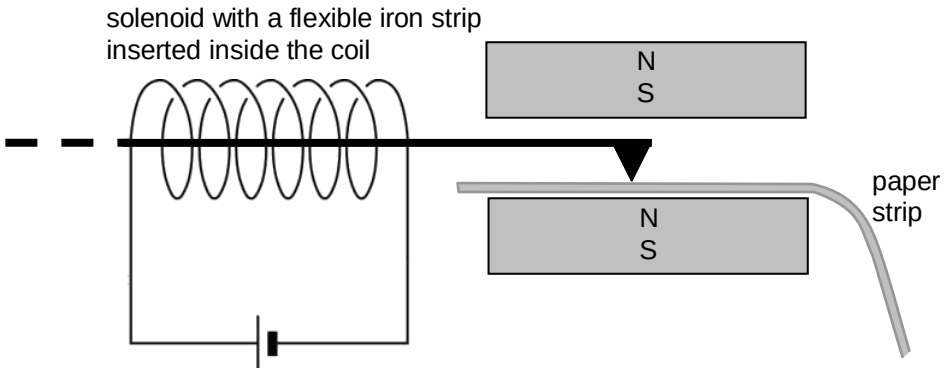
C Replace the battery with a high frequency a.c. power supply of voltage *V*.

D Use thicker wire to make the solenoid.

{{<P=41><C=04><S=core><T=MC><M=2><L=2><X=H><id=036>}}

4141036

★ A student has constructed the following device to put dots on a paper strip. However, the device does not work as he planned.



Which of the following can make the device work?

A Increase the number of turns of the solenoid.

B Replace the battery connected to the solenoid with an a.c. power supply.

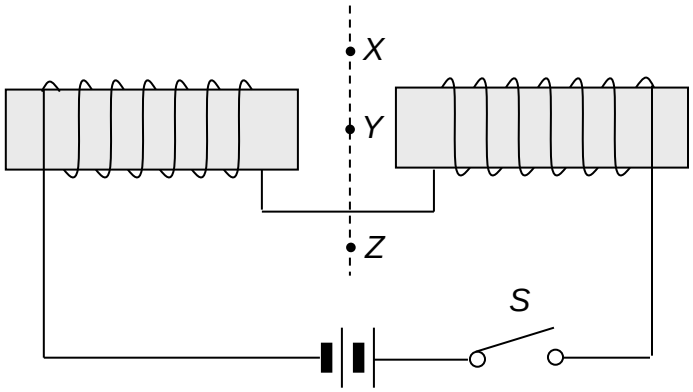
C Reverse the poles of each of the magnets.

D Insert a metal core inside the solenoid.

{{<P=41><C=04><S=core><T=MC><M=2><L=2><X=H><id=037>}}

4141037

★ In the following figure, *X*, *Y* and *Z* lie on the middle line between two identical solenoids.



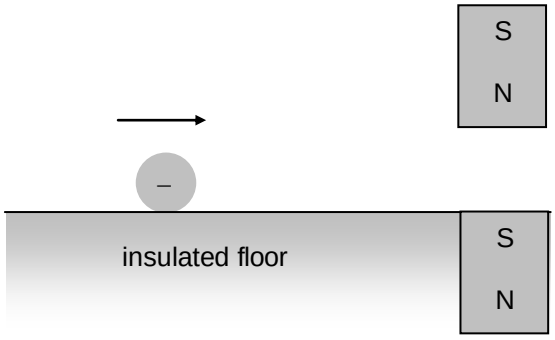
What are the directions of the magnetic field at *X*, *Y* and *Z* when switch *S* is closed?

	X	***Y***	***Z***
A	Upwards	(No magnetic field)	Downwards
B	(No magnetic field)	(No magnetic field)	(No magnetic field)
C	Downwards	Downwards	Upwards
D	Downwards	(No magnetic field)	Upwards

{{<P=41><C=04><S=core><T=MC><M=2><L=2><X=H><id=038>}}

4141038

★ In the following figure, a negatively charged sphere is running on an insulated floor and it is about to move between the magnets.



In which direction will the sphere bend when it enters the region between the magnets?

A Upwards

B Out of the paper

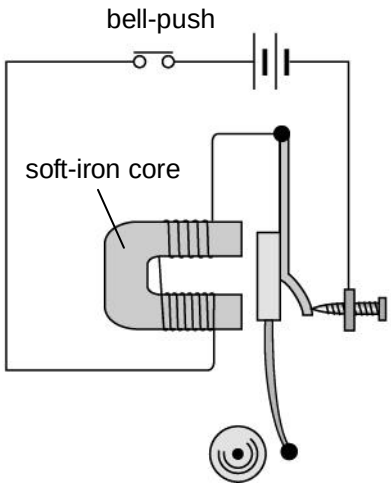
C Into the paper

D To the left

{{<P=41><C=04><S=core><T=MC><M=2><L=2><X=H><id=039>}}

4141039

★ The following figure shows an electric bell.



Which of the following methods can increase the loudness of the hitting sound?

(1) Push the bell-push faster and harder.

(2) Use a larger soft-iron core.

(3) Connect more cells in series with the battery.

A (3) only

B (1) and (2) only

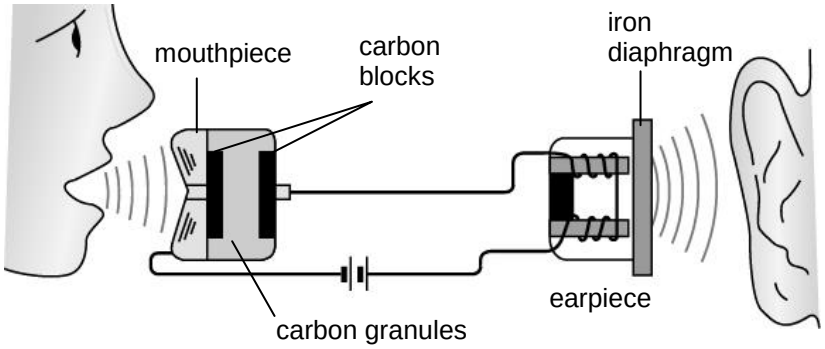
C (1) and (3) only

D (2) and (3) only

{{<P=41><C=04><S=core><T=MC><M=2><L=2><X=H><id=040>}}

4141040

★ The following figure shows a simplified telephone system.



Which of the following can increase the sensitivity of the earpiece?

(1) Increase the number of turns of the solenoid.

(2) Use a thinner iron diaphragm.

(3) Replace carbon granules with a carbon block.

A (1) and (2) only

B (1) and (3) only

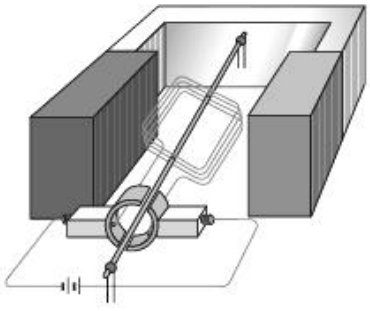
C (2) and (3) only

D (1), (2) and (3)

{{<P=41><C=04><S=core><T=MC><M=2><L=2><X=H><id=041>}}

4141041

★ The following figure shows a simple d.c. motor.



Which of the following statements about the motor are correct?

(1) The rotating speed can be increased by increasing the length of the coil.

(2) The direction of the current flowing along a particular side of the coil remains unchanged.

(3) If a curved pole magnet is used, the coil can run more smoothly and faster.

A (1) and (2) only

B (1) and (3) only

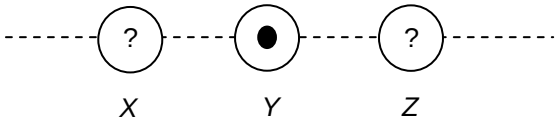
C (2) and (3) only

D (1), (2) and (3)

{{<P=41><C=04><S=core><T=MC><M=2><L=2><X=H><id=042>}}

4141042

★ Wires *X*, *Y* and *Z* are three parallel straight wires. They are evenly separated and carrying currents of equal size. It is known that the current in wire *Y* flows out of the paper.



If the resultant force acting on wire *Y* is towards the left, what are the directions of the currents in wires *X* and *Z*?

	Wire *X*	**Wire *Z***
A	Out of the paper	Out of the paper
B	Out of the paper	Into the paper
C	Into the paper	Out of the paper
D	Into the paper	Into the paper

{{<P=41><C=04><S=core><T=MC><M=2><L=2><X=H><id=043>}}

4141043

★ A copper wire is wound around a screwdriver as shown. When the wire is connected to a 9-V battery, the screwdriver becomes an electromagnet.

Which of the following ways can increase the strength of the electromagnet?

A Reduce the number of turns of the coil.

B Use a thicker wire to make the coil (same number of turns).

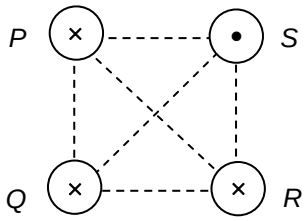
C Replace the 9-V battery by two 9-V batteries connected in parallel.

D Replace the 9-V battery by a 9-V a.c. power supply.

{{<P=41><C=04><S=core><T=MC><M=2><L=2><X=H><id=044>}}

4141044

★ Four long parallel wires *P*, *Q*, *R* and *S* carrying currents of equal size are placed at the corners of a square. The currents in *P*, *Q* and *R* flow into the paper while the current in *S* flows out of the paper.



What is the direction of the magnetic field in the middle of the square?

A Towards *P*

B Towards *Q*

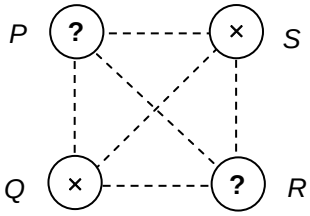
C Towards *R*

D Towards *S*

{{<P=41><C=04><S=core><T=MC><M=2><L=2><X=H><id=045>}}

4141045

★ Four long parallel wires *P*, *Q*, *R* and *S* carrying equal current are placed at the corners of a square. The currents in *Q* and *S* flow into the paper.



If the magnetic field in the middle of the square points towards *S*, what are the directions of current in *P* and *R*?

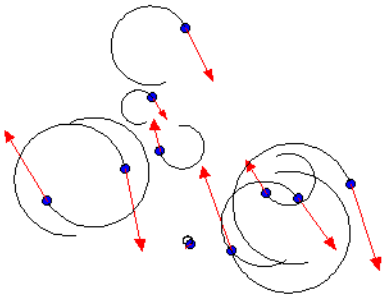
	Wire *P*	**Wire *R***
A	Into the paper	Into the paper
B	Into the paper	Out of the paper
C	Out of the paper	Into the paper

D Out of the paper Out of the paper

{{<P=41><C=04><S=core><T=MC><M=2><L=2><X=H><id=046>}}

4141046

★ A number of electrons are moving in a uniform magnetic field. Their paths are tracked as shown below. The vectors denote the velocity of the electrons.



What is the direction of the magnetic field?

A To the left

B To the right

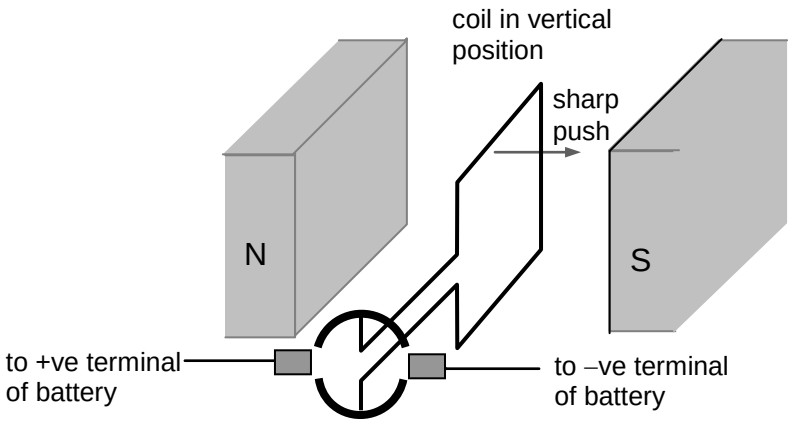
C Into the paper

D Out of the paper

{{<P=41><C=04><S=core><T=MC><M=2><L=3><X=H><id=047>}}

4141047

★★ The coil of a motor lies along the vertical plane at the beginning as shown in the following figure.



The upper side of the coil is pushed sharply towards the south pole of the magnet. What is the motion of the coil when viewed from the commutator?

A The coil rotates in clockwise direction.

B The coil rotates in anticlockwise direction.

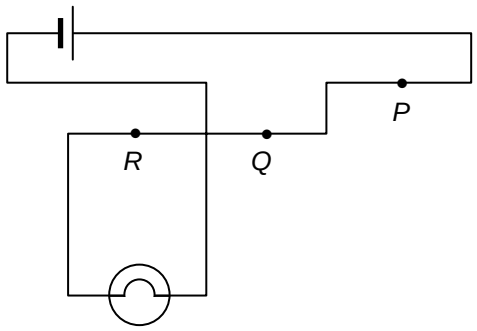
C The coil vibrates about the vertical plane.

D The coil changes rotation direction for every half of the revolution.

{{<P=41><C=04><S=core><T=MC><M=2><L=3><X=H><id=048>}}

4141048

★★ A student puts three compasses above the connecting wire at *P*, *Q* and *R* in the following circuit. The compasses are of the same distance above the wire.



Which of the following is the correct descending order of the relative deflection of the compass needle?

A $P > Q > R$

B $Q > P > R$

C $Q > R > P$

D $R > Q > P$

{{<P=41><C=04><S=core><T=MC><M=2><L=2><X=H><id=049>}}

4141049

★

1st statement	2nd statement
If the travelling direction of a charged particle makes an angle with the magnetic field, it will move faster and faster.	If the travelling direction of a charged particle makes an angle with the magnetic field, a magnetic force will act on the particle.

{{<P=41><C=04><S=core><T=MC><M=2><L=2><X=H><id=050>}}

4141050

★

1st statement	2nd statement
When we do an experiment to investigate the magnetic field due to current, the connecting wires should be put far away from the compass/iron filings.	There is magnetic field around current-carrying connecting wires.

{{<P=41><C=04><S=core><T=MC><M=2><L=2><X=H><id=051>}}

4141051

★

1st statement	2nd statement
Some motors use electromagnets rather than permanent magnets.	An electromagnet can give a more uniform magnetic field than a permanent magnet.

{{<P=41><C=04><S=core><T=MC><M=2><L=2><X=H><id=052>}}

4141052

★

1st statement	2nd statement
The S-pole of a magnet attracts iron grains.	The moving directions of iron grains in a magnetic field give the directions of the magnetic field lines.

{{<P=41><C=04><S=core><T=MC><M=2><L=2><X=H><id=053>}}

4141053

★

1st statement	2nd statement
The north pole of a magnet points towards the South Pole of the earth.	Unlike poles of magnets attract each other.

{{<P=41><C=04><S=core><T=MC><M=2><L=2><X=H><id=054>}}

4141054

★

1st statement	2nd statement
No magnetic force acts on a charged particle if it moves along a magnetic field line.	By Fleming's left hand rule, a magnetic force arises only when the current and the magnetic field are at a right angle.

{{<P=41><C=04><S=core><T=MC><M=2><L=2><X=H><id=055>}}

4141055

★

1st statement	2nd statement
Every magnet has a north pole and a south pole.	A north pole and a south pole attract each other.

{{<P=41><C=04><S=core><T=MC><M=2><L=2><X=H><id=056>}}

4141056

★

1st statement	2nd statement
In a simple d.c. motor, the current in the coil reverses direction every half-turn.	In a simple d.c. motor, the coil reverses its rotating direction every half-turn.

{{<P=41><C=04><S=core><T=MC><M=2><L=2><X=H><id=057>}}

4141057

★

1st statement	2nd statement
A magnetic field does not do work on a charge moving in it.	The magnetic force is always perpendicular to the motion of a charge moving inside a magnetic field.